CONTENTS

1 Scope 19
2 ~~Normative~~ References 22
3 Terms and definitions 25
4 General 27
4.1 Apparatus grouping and temperature classification 27
4.2 Potential ignition sources 28
5 Temperatures 28
5.1 Environmental influences 28
5.2 Service temperature 28
5.3 Maximum surface temperature 28
5.4 Surface temperature and ignition temperature 28
5.5 Small components 29
6 Requirements for electrical apparatus 29
6.1 General 29
6.2 Mechanical strength of apparatus 29
6.3 Opening times 29
6.4 Circulating currents 29
6.5 Gasket retention 29
6.6 Degree of protection of enclosure (IP) 29
6.7 Clearances, creepage distances and separations 30
6.8 Electric strength 39
7 Non-metallic enclosures and non-metallic parts of enclosures 40
7.1 General 40
7.2 Thermal endurance 40
7.3 Electrostatic charges on external non-metallic materials of enclosures 41
7.4 Threaded holes 41
7.5 Thermal shock 41
7.6 Resistance to light 41
8 Enclosures containing light metals 41
8.1 Material composition 41
8.2 Threaded holes 41
9 Fasteners 41
9.1 General 41
9.2 Special fasteners 41
10 Interlocking devices 41
11 Bushings 41
12 Materials used for cementing 41
13 Ex components 42
13.1 Type of protection “n” 42

13.2 Mounting 42
13.3 Internal mounting 42
13.4 External mounting 42
14 Connection facilities and terminal compartments 42
14.1 General 43
14.2 Connection for external conductors 43
14.3 Internal connection facilities 44
15 Connection facilities for earthing or bonding conductors 44
16 Entries into enclosures 44
17 Supplementary requirements for non-sparking electrical machines 44
17.1 General 44
17.2 Connection facilities for external conductors 45
17.3 Neutral point connections 46
17.4 Radial air gap 46
~~17.5 Ventilation systems~~ 47
~~17.6 Bearing seals and shaft seals~~ 47
17.7 Rotor cages 47
17.8 Surface temperature limitation 49
~~17.9 Additional requirements for machines with rated voltage greater than 1 kV~~ 50
17.10 Stator winding insulation system 51
18 Supplementary requirements for switchgear 52
19 Supplementary requirements for non-sparking fuses and fuse assemblies 52
19.1 Fuses 52
19.2 Temperature class of an apparatus 52
19.3 Fuse mounting 52
19.4 Fuse enclosures 52
19.5 Replacement fuse identification 52
20 Supplementary requirements for non-sparking plugs and sockets 52
20.1 Plugs and sockets for external connections 52
20.2 Maintaining degree of protection 53
20.3 Plugs and sockets for internal connections 53
20.4 Sockets that do not have plugs inserted in normal operation 53
21 Supplementary requirements for non-sparking luminaires 53
21.1 General 53
21.2 Construction 54
21.3 Other apparatus containing light sources 60
22 Supplementary requirements for apparatus incorporating non-sparking cells and batteries 60
22.1 Categorization of cells and batteries 60
22.2 General requirements for cells and batteries of types 1 and 2 61
22.3 Charging of type 1 cells and batteries 63
22.4 Charging of type 2 cells and batteries 63
22.5 Requirements for type 3 secondary batteries 64

22.6 Verification and tests 67
23 Supplementary requirements for non-sparking low power apparatus 67
24 Supplementary requirements for non-sparking current transformers 68
25 Other electrical apparatus 68
26 General supplementary requirements for apparatus producing arcs, sparks or hot surfaces 68
27 Supplementary requirements for enclosed-break apparatus ~~devices~~ and non-incendive components producing arcs, sparks or hot surfaces 69
27.1 Type testing 69
27.2 Ratings 69
27.3 Construction of enclosed-break apparatus ~~devices~~ 69
28 Supplementary requirements for hermetically-sealed apparatus ~~devices~~ producing arcs, sparks or hot surfaces 70
29 Supplementary requirements for sealed apparatus ~~devices~~ or encapsulated apparatus ~~devices~~ producing arcs, sparks or hot surfaces 70
29.1 Non-metallic materials 70
29.2 Opening 70
29.3 Internal spaces 70
29.4 Handling 71
29.5 Resilient gasket and seals 71
29.6 Encapsulating compounds 71
29.7 Thickness of encapsulant 71
29.8 Type tests 71
30 Supplementary requirements for energy-limited apparatus and circuits producing arcs, sparks or hot surfaces 72
30.1 General 72
30.2 Associated energy-limited apparatus 72
30.3 Energy-limited apparatus 72
30.4 Self protected energy-limited apparatus 72
30.5 Separation of conducting parts 73
30.6 Plugs and sockets 73
30.7 Protection against polarity reversal 73
30.8 Requirements for components on which energy limitation depends 73
30.9 Battery powered apparatus 74
30.10 Marking and documentation 74
31 Supplementary requirements for restricted-breathing enclosures protecting apparatus producing arcs, sparks or hot surfaces 74
31.1 General 74
31.2 Test point for restricted-breathing apparatus 75
31.3 Test point exemption 75
31.4 Gasket and seal requirements 75
31.5 Non-resilient seals 75
31.6 Maintenance considerations 75
31.7 Internal fans 75

32 General information on verification and tests 75
33 Type tests 76
33.1 Representative samples 76
33.2 Test configuration 76
33.3 Tests for enclosures on which the type of protection depends 76
33.4 Test for enclosed-break apparatus ~~devices~~ and non-incendive components 78
33.5 Tests for sealed apparatus ~~devices~~ and encapsulated apparatus ~~devices~~ 80
33.6 Assessment and test of energy-limited apparatus and circuits 82
33.7 Tests for restricted-breathing enclosures 82
33.8 Test for screw lampholders 83
33.9 Test for starter holders for luminaires 83
33.10 Tests for electronic starters for tubular fluorescent lamps and for ignitors for high pressure sodium or metal halide lamps 84
33.11 Test for wiring of luminaires subject to high-voltage impulses from ignitors 85
33.12 Mechanical shock test for batteries 85
33.13 Insulation resistance test for batteries 86
33.14 Additional ignition tests for large or high-voltage machines 87
34 Routine verifications and tests 88
34.1 General 88
34.2 Specific routine tests 88
35 Marking 89
35.1 General 89
35.2 Additional marking for batteries 89
35.3 Examples of marking 90
36 Documentation 91
37 Instructions 92
Annex A (informative) – United States major deviations 93
Annex B (informative) – Bibliography 97